Aerodynamic Optimisation Of Small Scale Horizontal Axis

A review of the aerodynamics, design and analysis, and optimization of wind turbines, combined with the author's unique software Aerodynamics of Wind Turbines is a comprehensive introduction to the aerodynamics, scaled design and analysis, and optimization of horizontal-axis wind turbines. The author –a noted expert on the topic – reviews the fundamentals and basic physics of wind turbines operating in the atmospheric boundary layer. He then explores more complex models that help in the aerodynamic analysis and design of turbine models. The text contains unique chapters on blade element momentum theory, airfoil aerodynamics, rotational augmentation, vortex-wake methods, actuator-line modeling, and designing aerodynamically scaled turbines for model-scale experiments. The author clearly demonstrates how effective analysis and design principles can be used in a wide variety of applications and operating conditions. The book integrates the easy-to-use, hands-on XTurb design and analysis software that is available on a companion website for facilitating individual analyses and future studies. This component enhances the learning experience and helps with a deeper and more complete understanding of the subject matter. This important book: Covers aerodynamics, design and analysis and optimization of wind turbines Offers the author's XTurb design and analysis software that is available on a companion website for individual analyses and future studies Includes unique chapters on blade element momentum theory, airfoil aerodynamics, rotational augmentation, vortex-wake methods, actuator-line modeling, and designing aerodynamically scaled turbines for model-scale experiments Demonstrates how design principles can be applied to a variety of applications and operating conditions Written for senior undergraduate and graduate students in wind energy as well as practicing engineers and scientists, Aerodynamics of Wind Turbines is an authoritative text that offers a guide to the fundamental principles, design and analysis of wind turbines.

This book comprises select papers presented at the conference on Technology Innovation in Mechanical Engineering (TIME-2021). The book discusses the latest innovation and advanced research in the diverse field of Mechanical Engineering such as materials, manufacturing processes, evaluation of materials properties for the application in automotive, aerospace, marine, locomotive and energy sectors. The topics covered include advanced metal forming, Energy Efficient systems, Material Characterization, Advanced metal forming, bending, welding & casting techniques, Composite and Polymer Manufacturing, Intermetallics, Future generation materials, Laser Based Manufacturing, High-Energy Beam Processing, Nano materials, Smart Material, Super Alloys, Powder Metallurgy and Ceramic Forming, Aerodynamics, Biological Heat & Mass Transfer, Combustion & Propulsion, Cryogenics, Fire Dynamics, Refrigeration & Air Conditioning, Sensors and Transducers, Turbulent Flows, Reactive Flows, Numerical Heat Transfer, Phase Change Materials, Micro- and Nano-scale Transport, Multi-phase Flows, Nuclear & Space Applications, Flexible Manufacturing Technology & System, Non-Traditional Machining processes, Structural Strength and Robustness, Vibration, Noise Analysis and Control, Tribology. In addition, it discusses industrial applications and cover theoretical and analytical methods, numerical simulations and experimental techniques in the area of Mechanical Engineering. The book will be helpful for academics, including graduate students and researchers, as well as professionals interested in interdisciplinary topics in the areas of materials, manufacturing, and energy sectors.

The book reports on the latest theoretical and experimental advances in the field of active flow and combustion control. It covers new developments in actuator technology and sensing, in robust and optimal open- and closed-loop control, as well as in model reduction for control. It collects contributions presented during the third edition of the Active Flow and Combustion Control conference, held in September 10-12, 2014 at the Technische Universität Berlin (Germany). This conference, as well as the research presented in the book, have been supported by the collaborative research center SFB 1029 -Substantial efficiency increase in gas turbines through direct use of coupled unsteady combustion and flow dynamics, funded by the DFG (German Research Foundation).

Parallel Computational Fluid Dynamics 2007

Applied Aerodynamics

Progress in Vehicle Aerodynamics

Identification Modeling and Characteristics of Miniature Rotorcraft

Large-Scale PDE-Constrained Optimization

Complementary Resources for Tomorrow

This book introduces a stability and control methodology named AeroMech, capable of sizing the primary control effectors of fixed wing subsonic to hypersonic designs of conventional and unconventional configuration layout. Control power demands are harmonized with static-, dynamic-, and maneuver stability requirements, while taking the six-degree-of-freedom trim state into account. The stability and control analysis solves the static- and dynamic equations of motion combined with non-linear vortex lattice aerodynamics for analysis. The true complexity of addressing subsonic to hypersonic vehicle stability and control during the conceptual design phase is hidden in the objective to develop a generic (vehicle configuration independent) methodology concept. The inclusion of geometrically asymmetric aircraft layouts, in addition to the reasonably well-known symmetric aircraft types, contributes significantly to the overall technical complexity and level of abstraction. The first three chapters describe the preparatory work invested along with the research strategy devised, thereby placing strong emphasis on systematic and thorough knowledge utilization. The engineering-scientific method itself is derived throughout the second half of the book. This book offers a unique aerospace vehicle configuration independent (generic) methodology and mathematical algorithm. The approach satisfies the initial technical quest: How to develop a 'configuration stability & control' methodology module for an advanced multi-disciplinary aerospace vehicle design synthesis environment that permits consistent aerospace vehicle design evaluations?

The book contains the research contributions belonging to the Special Issue "Numerical Simulation of Wind Turbines", published in 2020-2021. They consist of 15 original research papers and 1 editorial. Different topics are discussed, from innovative design solutions for large and small wind turbine to control, from advanced simulation techniques to noise prediction. The variety of methods used in the research contributions testifies the need for a holistic approach to the design and simulation of modern wind turbines and will be able to stimulate the interest of the wind energy community.

Written by an internationally recognized teacher and researcher, this book provides a thorough, modern treatment of the aerodynamic principles of helicopters and other rotating-wing vertical lift aircraft such as tilt rotors and autogiros. The text begins with a unique technical history of helicopter flight, and then covers basic methods of rotor aerodynamic analysis, and related issues associated with the performance of the helicopter and its aerodynamic design. It goes on to cover more advanced topics in helicopter aerodynamics, including airfoil flows, unsteady aerodynamics, dynamic stall, and rotor wakes, and rotor-airframe aerodynamic interactions, with final chapters on autogiros and advanced methods of helicopter aerodynamic analysis. Extensively illustrated throughout, each chapter includes a set of homework problems. Advanced undergraduate and graduate students, practising engineers, and researchers will welcome this thoroughly revised and updated text on rotating-wing aerodynamics.

IMDC-SDSP 2020

Aeronautical Engineering

The Aerodynamics of Heavy Vehicles: Trucks, Buses, and Trains

Solar Energy Update

Proceedings of the IUTAM Symposium Held in Göottingen, Germany 2-6 September 2002

Modifying the Aerodynamics of Your Road Car

The aim of this work, consisting of 9 individual, self-contained booklets, is to describe commercial vehicle technology in a way that is clear, concise and illustrative. Compact and easy to understand, it provides an overview of the technology that goes into modern commercial vehicles. Starting from the customer's fundamental requirements, the characteristics and systems that define the design of the vehicles are presented knowledgeably in a series of articles, each of which can be read and studied on their own. In this volume, The Driver's Cab, the vehicle cab is reviewed in simple terms for the layman. The three functions it must support, driving, living and sleeping and the features of the cab equipment provided therefor are presented. Important systems of the driver's cab are discussed in readily understandable terms.

Train Aerodynamics: Fundamentals and Applications is the first reference to provide a comprehensive overview of train aerodynamics with full scale data results. With the most up-to-date information on recent advances and the possibilities of improvement in railway facilities, this book will benefit railway engineers, train operators, train manufacturers, infrastructure managers and researchers of train aerodynamics. As the subject of train aerodynamics has evolved slowly over the last few decades with train speeds gradually increasing, and as a result of increasing interest in new train types and high-speed lines, this book provides a timely resource on the topic. Examines the fundamentals and the state-of-the-art of train aerodynamics, beginning with experimental, numerical and analytical tools, and then thoroughly discussing the specific approaches in other sections Features the latest developments and progress in computational aerodynamics and experimental facilities Addresses problems relating to train aerodynamics, from the dimensioning of railway structures and trains, to risk analysis related to safety issues and maintenance Discusses basic flow patterns caused by bridges and embankments

This book constitutes the refereed proceedings of the Second International Conference on Evolutionary Multi-Criterion Optimization, EMO 2003, held in Faro, Portugal, in April 2003. The 56 revised full papers presented were carefully reviewed and selected from a total of 100 submissions. The papers are organized in topical sections on objective handling and problem decomposition, algorithm improvements, online adaptation, problem construction, performance analysis and comparison, alternative methods, implementation, and applications.

IUTAM Symposium Transsonicum IV

March 17-21, 1986

Vehicle Aerodynamics

A Generic Approach from Subsonic to Hypersonic Speeds

Principles of Helicopter Aerodynamics with CD Extra

Contributions to the 21st STAB/DGLR Symposium, Darmstadt, Germany, 2018

This book presents recent progress in the application of RANS turbulence models based on the Reynolds stress transport equations. A variety of models has been implemented by different groups into different flow solvers and applied to external as well as to turbo machinery flows. Comparisons between the models allow an assessment of their performance in different flow conditions. The results demonstrate the general applicability of differential Reynolds stress models to separating flows in industrial aerodynamics.

Proceedings of the IUTAM Symposium held in Göttingen, Germany, 2-6 September 2002

IMDC-SDSP conference offers an exceptional platform and opportunity for practitioners, industry experts, technocrats, academics, information scientists, innovators, postgraduate students, and research scholars to share their experiences for the advancement of knowledge and obtain critical feedback on their work. The timing of this conference coincides with the rise of Big Data, Artificial Intelligence powered applications, Cognitive Communications, Green Energy, Adaptive Control and Mobile Robotics towards maintaining the Sustainable Development and Smart Planning and management of the future technologies. It is aimed at the knowledge generated from the integration of the different data sources related to a number of active real-time applications in supporting the smart planning and enhance and sustain a healthy environment. The conference also covers the rise of the digital health, well-being, home care, and patient-centred era for the benefit of patients and healthcare providers; in addition to how supporting the development of a platform of smart Dynamic Health Systems and self-management.

Aerodynamic Optimisation of a Small-scale Wind Turbine Blade for Low Windspeed Conditions

Proceedings of Energy & Resources for Tomorrow 2019, University of Windsor, Canada

Train Aerodynamics

Vehicle thermal Management Systems Conference and Exhibition (VTMS10)

Scientific and Technical Aerospace Reports

Proceedings of the International Conference of Experimental and Numerical Investigations and New Technologies, CNNTech 2021

This book brings together the state-of-the-art in energy and resources research. It covers wind, solar, hydro and geothermal energy, as well as more conventional power generation technologies, such as internal combustion engines. Related areas of research such as the environmental sciences, carbon dioxide emissions, and energy storage are also addressed.

This book contains the papers presented at the IMechE and SAE International, Vehicle Thermal Management Systems Conference (VTMS10), held at the Heritage Motor Centre, Gaydon, Warwickshire, 15-19th May 2011. VTMS10 is an international conference organised by the Automobile Division and the Combustion Engines and Fuels Group of the IMechE and SAE International. The event is aimed at anyone involved with vehicle heat transfer, members of the OEM, tier one suppliers, component and software suppliers, consultants, and academics interested in all areas of thermal energy management in vehicles. This vibrant conference, the tenth VTMS, addresses the latest analytical and development tools and techniques, with sessions on: alternative powertrain, emissions, engines, heat exchange/manufacture, heating, A/C, comfort, underhood, and external/internal component flows. It covers the latest in research and technological advances in the field of heat transfer, energy management, comfort and the efficient management of all thermal systems within the vehicle. Aimed at anyone working in or involved with vehicle heat transfer Covers research and technological advances in heat transfer, energy management, comfort and efficient management of thermal systems within the vehicle

Flapping flight is one of the most widespread mean of transportation. It is a complex unsteady aerodynamic problem that has been studied extensively in the past century. Nevertheless, by its complex nature, flapping flight remains a challenging subject. With the development of micro air vehicles, researchers need new computational methods to design these aircrafts efficiently. In this dissertation, I will present three different methods of optimization for flapping flight with an emphasis on hovering with each their advantages and drawbacks. The first method was developed by Hall et al. It is an extremely fast and powerful three-dimensional approach. However, the assumptions made to develop this theory limit its use to lightly loaded wings. In addition, it only models the motion of the trailing edge and not the actual motion of the wing. In a second part, I will present a two-dimensional unsteady potential method. It uses a freely convected wake which removes the lightly loaded restriction. This method shows the existence of an optimal combination of plunging and pitching motion. The motion is optimal in the sense that for a required force vector, the aerodynamic power is minimal. The last method incorporates the three-dimensional effects. These effects are especially important for low aspect ratio wings. Thus, a three-dimensional unsteady potential vortex method was developed. This method also exhibits the presence of an optimal flapping/pitching motion. In addition, it agrees really well with the two previous methods and with the actual kinematics of birds during hovering flapping flight. To conclude, some preliminary design tools for flapping wings in forward and hovering flight are presented in this thesis.

MIRA Automobile Abstracts

Implementations and Experiences on Large Scale and Grid Computing

International Aerospace Abstracts

The Driver´s Cab

Active Flow and Combustion Control 2014

A Continuing Bibliography with Indexes

This book is a printed edition of the Special Issue "Offshore Renewable Energy: Ocean Waves, Tides and Offshore Wind" that was published in Energies

This volume introduces an approach to developing a simple and effective linear parameterized model of vehicle dynamics using the CIFERa identification tool created by the Army/NASA Rotorcraft Division.

This book gathers contributions to the 21st biannual symposium of the German Aerospace Aerodynamics Association (STAB) and the German Society for Aeronautics and Astronautics (DGLR). The individual chapters reflect ongoing research conducted by the STAB members in the field of numerical and experimental fluid mechanics and aerodynamics, mainly for (but not limited to) aerospace applications, and cover both nationally and EC-funded projects. Special emphasis is given to collaborative research projects conducted by German scientists and engineers from universities, research-establishments and industries. By addressing a number of cutting-edge applications, together with the relevant physical and mathematics fundamentals, the book provides readers with a comprehensive overview of the current research work in the field. The book's primary emphasis is on aerodynamic research in aeronautics and astronautics, and in ground transportation and energy as well.

Differential Reynolds Stress Modeling for Separating Flows in Industrial Aerodynamics

Offshore Renewable Energy: Ocean Waves, Tides and Offshore Wind

Aerodynamics of Wind Turbines

Design and Optimisation of Morphing Aircraft

Second International Conference, EMO 2003, Faro, Portugal, April 8-11, 2003, Proceedings

Design Optimization of Fluid Machinery

Aerodynamics, from a modern point of view, is a branch of physics that study physical laws and their applications, regarding the displacement of a body into a fluid, such concept could be applied to any body moving in a fluid at rest or any fluid moving around a body at rest. This Book covers a small part of the numerous cases of stationary and non stationary aerodynamics; wave generation and propagation; wind energy; flow control techniques and, also, sports aerodynamics. It's not an undergraduate text but is thought to be useful for those teachers and/or researchers which work in the several branches of applied aerodynamics and/or applied fluid dynamics, from experiments procedures to computational methods.

Optimal design, optimal control, and parameter estimation of systems governed by partial differential equations (PDEs) give rise to a class of problems known as PDE-constrained optimization. The size and complexity of the discretized PDEs often pose significant challenges for contemporary optimization methods. With the maturing of technology for PDE simulation, interest has now increased in PDE-based optimization. The chapters in this volume collectively assess the state of the art in PDE-constrained optimization, identify challenges to optimization presented by modern highly parallel PDE simulation codes, and discuss promising algorithmic and software approaches for addressing them. These contributions represent current research of two strong scientific computing communities, in optimization and PDE simulation. This volume merges perspectives in these two different areas and identifies interesting open questions for further research.

The purpose of this work is to improve the efficiency of large scale axial flow fans through the introduction of a more uniform velocity distribution over the fan blades. This improved velocity di tribution being realized through the use of an aerodynamically optimized inlet cone. The procedure for optimization the inlet cone uses existing aerodynamic optimization methods programmed into a completely self contained FORTRAN program. The type of optimization algorithm used here is the use of design optimization to solve an inverse design problem. The different modules of the program include a surface vorticity panel method flow solver, a Bezier curve surface definition routine and a minimization method. Three different minimization methods were tested to determine the most appropriate one, this being the downhill simplex method in multidimensions. Many different sized fans and inlet cones were tested, with two different types of optimized inlet cones being discovered. Short inlet cones typically make use of avery blunt inlet cone with a slight hump or rise above the hub radius. Longer inlet cones make use of a more curved inlet cone with no hump. It was also shown that the hub-to-tip ratio of the fan has a significant impact on the velocity distribution and therefore the efficiency of the fan unit. As well, it was shown that only a small change in the length of the inlet cone could affect the velocity istribution. It was also found from this work that the relatively simple methods used can provide an adequate modeling of the problem and a easonable solution.

Select Proceedings of TIME 2021

Stress Analysis and Aerodynamic Optimization of Small-scale Compressed Air Turbines

Optimization of the Aerodynamics of Small-scale Flapping Aircraft in Hover

Stability and Control of Conventional and Unconventional Aerospace Vehicle Configurations

Proceedings of the 1st International Multi-Disciplinary Conference Theme: Sustainable Development and Smart Planning, IMDC-SDSP 2020, Cyperspace, 28-30 June 202

Applying Computational Fluid Dynamics and Numerical Optimization

It is our pleasure to present these proceedings from the United Engineering Foundation Conference on The Aerodynamics of Heavy Vehicles: Trucks, Buses and Trains held December 2-6, 2002, in Monterey, California. This Department of Energy, United Engineering Foundation, and industry sponsored conference brought together 90 leading engineering researchers from around the world to discuss the aerodynamic drag of heavy vehicles. Participants from national labs, academia, and industry, including truck manufacturers, discussed how computer simulation and experimental techniques could be used to design more fuel efficient trucks, buses, and trains. Conference topics included comparison of computational fluid dynamics calculations using both steady and unsteady Reynolds-averaged Navier-Stokes, large-eddy simulation, and hybrid turbulence models and experimental data obtained from the Department of Energy sponsored and other wind tunnel experiments. Advanced experimental techniques including three-dimensional particle image velocimetry were presented, along with their use in evaluating drag reduction devices. We would like to thank the UEF conference organizers for their dedication and quick response to sudden deadlines. In addition, we would like to thank all session chairs, the scientific advisory committee, authors, and reviewers for their many hours of dedicated effort that contributed to a successful conference and resulted in this document of the conference proceedings. We also gratefully acknowledge the support received from the United Engineering Foundation, the US Department of Energy, Lawrence Livermore National Laboratory, Volvo Trucks America, International Truck and Engine Corporation, and Freightliner LLC.

At the 19th Annual Conference on Parallel Computational Fluid Dynamics held in Antalya, Turkey, in May 2007, the most recent developments and implementations of large-scale and grid computing were presented. This book, comprised of the invited and selected papers of this conference, details those advances, which are of particular interest to CFD and CFD-related communities. It also offers the results related to applications of various scientific and engineering problems involving flows and flow-related topics. Intended for CFD researchers and graduate students, this book is a state-of-the-art presentation of the relevant methodology and implementation techniques of large-scale computing.

Design Optimization of Fluid Machinery: Applying Computational Fluid Dynamics and Numerical Optimization Drawing on extensive research and experience, this timely reference brings together numerical optimization methods for fluid machinery and its key industrial applications. It logically lays out the context required to understand computational fluid dynamics by introducing the basics of fluid mechanics, fluid machines and their components. Readers are then introduced to single and multi-objective optimization methods, automated optimization, surrogate models, and evolutionary algorithms. Finally, design approaches and applications in the areas of pumps, turbines, compressors, and other fluid machinery systems are clearly explained, with special emphasis on renewable energy systems. Written by an international team of leading experts in the field Brings together optimization methods using computational fluid dynamics for fluid machinery in one handy reference Features industrially important applications, with key sections on renewable energy systems Design Optimization of Fluid Machinery is an essential guide for graduate students, researchers, engineers working in fluid machinery and its optimization methods. It is a comprehensive reference text for advanced students in mechanical engineering and related fields of fluid dynamics and aerospace engineering.

Aerodynamic Shape Optimization of Axial Flow Fans

Fundamentals and Applications

Numerical Simulation of Wind Turbines

Energy Research Abstracts

Evolutionary Multi-Criterion Optimization

This unique handbook assumes no starting knowledge of vehicle aerodynamics. It begins with simple ideas and finishes with sophisticated and effective aerodynamic modifications that work. Three major chapters cover on-road testing techniques that give you all the information you need to decide what modifications you should make – and, after you've made them, how well they work. Low-cost techniques allow you to visualise the patterns of airflow over your car so that you can actually see the problem areas that need improvement. Uniquely, you're also shown how to measure aerodynamic pressures, so you can determine which body surfaces are creating lift, drag and downforce. Want to work out where a wing should be placed? On-road testing to find that out is covered as well. The book also shows you how to measure downforce to see if that wing is actually working! If you wish to reduce drag, more than ten different areas are covered. Reducing frontal area, lowering cooling system drag, optimising vehicle ride height and rake, reducing the strength of the wake, achieving clean airflow separation and optimising wheel designs – they're all covered using the latest research findings. And if you're a performance driver, there's a major chapter devoted to reducing lift and improving stability. This chapter includes the design and development of undertrays and diffusers, wings and spoilers. The example car developed measurable downforce when fitted with an undertray and rear diffuser, something that transformed its on-road handling. The author has been writing about the aerodynamics of road cars for more than 25 years. He is also an experienced and proficient car modifier who has performed numerous aerodynamic modifications and upgrades to his own cars. The book's technical consultant, RH Barnard, is an acknowledged world leading automotive aerodynamicist. If you want a practical, hands-on guide that demystifies and explains car aerodynamics, and shows you how to make effective aerodynamic modifications to your car, this book is for you.

Aerodynamic Optimisation of a Small-scale Wind Turbine Blade for Low Windspeed ConditionsStress Analysis and Aerodynamic Optimization of Small-scale Compressed Air TurbinesOptimization of the Aerodynamics of Small-scale Flapping Aircraft in Hover

Government Reports Announcements & Index

New Results in Numerical and Experimental Fluid Mechanics XII

Automotive Technology International

Advanced Experimental Techniques

A Physical Basis for Analysis and Design

Technology Innovation in Mechanical Engineering